

PATENT ABSTRACTS OF JAPAN

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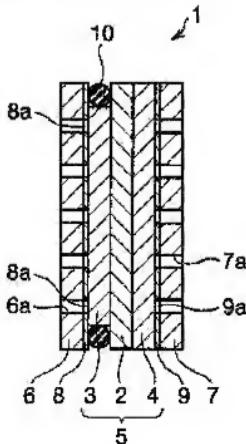
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(21)Application number : 2000-241001 (71)Applicant : SONY CORP

(22)Date of filing : 09.08.2000 (72)Inventor : SATO NOBUAKI

(54) ELECTRIC ENERGY GENERATING ELEMENT



(57)Abstract:

PROBLEM TO BE SOLVED: To provide an electric energy generating element capable of lowering the electrical contact resistance by improving the adhesiveness between a collector plate and an electrode without using a bolt, reducing the thickness of the whole of the structure and improving the output per unit area of the structure.

SOLUTION: A fuel cell 1 is provided with a conductor membrane 2 for conducting hydrogen ions, a hydrogen electrode made of carbon and adhered closely to one surface of the conductor membrane at one surface thereof, a first collector plate 6 conductively connected to the other surface of the hydrogen electrode, an oxygen electrode 7 made of carbon and adhered closely to the other surface of the conductor membrane at one surface thereof, and a second collector plate 7 conductively connected to the other surface of the oxygen electrode. A first conductive adhesive layer 8 is interposed between the hydrogen electrode 3 and the first collector plate 6 and a second conductive adhesive layer 9 is interposed between the oxygen electrode 4 and the second collector plate 7 to lower the contact resistance between the electrodes and the collector plates.

oxygen electrode. A first conductive adhesive layer 8 is interposed between the hydrogen electrode 3 and the first collector plate 6 and a second conductive adhesive layer 9 is interposed between the oxygen electrode 4 and the second collector plate 7 to lower the contact resistance between the electrodes and the collector plates.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application]Especially this invention relates to the fuel cell provided with the conductor film which intervenes between a hydrogen electrode, an oxygen electrode, and a hydrogen electrode and an oxygen electrode, and the charge collector of the couple arranged at the outside of a hydrogen electrode, and the outside of an oxygen electrode about an electrical energy generating element.

[0002]

[Description of the Prior Art]There is what is called a fuel cell that makes hydrogen and oxygen as shown in drawing 3 and drawing 4 react as an electrical energy generating element, and generates the electrical and electric equipment. The fuel cell 101 is provided with the generating cell 105 which consists of the conductor film 102, and the hydrogen electrode 103 and the oxygen electrode 104 which sandwich the conductor film 102, and the hydrogen pole charge collector 106 and the oxygen pole collector 107 which sandwich the generating cell 105 here.

[0003]The conductor film 102 is a film of the polymers which conduct only a hydrogen ion. The hydrogen electrodes 103 are carbon electrodes with a catalyst, and are stuck to the field of one of these in one field of the conductor film 102. The hydrogen pole charge collector 106 is a conductor, and is connected to the field of another side of the hydrogen electrode 103 in electric conduction. In order to supply hydrogen gas to the hydrogen electrode 103, two or more breakthroughs 106a are formed in the hydrogen pole charge collector 106. And in order to prevent a break through of the supplied hydrogen gas, the sealant 110 is arranged around the hydrogen electrode 103. The oxygen electrodes 104 are also carbon electrodes with a catalyst, and are stuck to the field of one of these in the field of another side of the conductor film 102. The oxygen pole collector 107 is a conductor and is connected to the field of another side of an oxygen electrode in electric conduction.

In order to supply air (oxygen) to the oxygen electrode 104, two or more breakthroughs 107a are formed also in the oxygen pole collector 107.

[0004]These charge collectors 106 and 107 are for making efficiently and easy drawing of the electric power generated in the generating cell 105.

Each adhesion with the hydrogen electrode 103 and the oxygen electrode 104 which counter is needed.

Therefore, the charge collectors 106 and 107 were formed more greatly than the outside dimension of these electrodes 103,104 or the conductor film 102, and the insulating bolt 108 is concluded between the charge collectors which do not lap with an electrode etc. And it is the outside of the generating cell 105, and between the charge collectors 106,107, the insulating spacer 109 was infix and the insulating bolt 108 has penetrated the inside of an insulating spacer.

[0005]

[Problem(s) to be Solved by the Invention]However, in the composition of the conventional fuel cell 101 shown in drawing 3 and drawing 4, the electric contact resistance of the charge collector 106,107 and the carbon electrodes 103 and 104 is large, and the collecting effect of the charge collectors 106 and 107 cannot demonstrate good. Since the insulating bolt 108 is arranged on the outside of the external profile of the

generating cell 105, only in the part, the size of the whole structure becomes large and the output per structure unit area declines. Since between the charge collectors 106,107 is concluded with the bolt 108 on the outside of the generating cell 105 as mentioned above, contact with the charge collectors 106 and 107 in the periphery of the electrode 103,104 can maintain to some extent, but, In the center section of the electrodes 103 and 104, when the charge collector 106,107 is thin, a charge collector bends, contact with the electrode 103,104 falls, and a collecting effect falls. In order to prevent this, it is necessary to improve the rigidity of the charge collector 106,107 but [then], and size increases as the increase of the thickness of a charge collector, and the whole structure. In order to raise contact in electrode 103,104 center section, when the center section of the electrode is also made to penetrate a bolt and it concludes, the power generation usable area of an electrode or a conductor film falls by the cross-section area of a bolt.

[0006]Then, this invention aims at the thing [it is possible to raise the adhesion of a charge collector and an electrode and to reduce electric contact resistance, without using a bolt, and] which the thickness of the whole structure can be decreased and can raise the output per structure unit area and for which an electrical energy generating element is provided.

[0007]

[Means for Solving the Problem]To achieve the above objects, in an electrical energy generating element characterized by comprising the following, this invention between this hydrogen electrode and this 1st charge collector, The 1st electroconductive glue layer intervenes, while sticking physically this hydrogen electrode and this 1st charge collector, improve conductivity for it, and between this oxygen electrode and this 2nd charge collector, An electrical energy generating element which is raising conductivity while the 2nd electroconductive glue layer intervenes and sticking physically this oxygen electrode and this 2nd charge collector.

A conductor film which conducts a hydrogen ion.

A hydrogen electrode arranged at this one conductor film side.

The 1st charge collector that has been arranged in an opposite hand and was electrically connected with this conductor film of this hydrogen electrode with this hydrogen electrode.

The 2nd charge collector that an oxygen electrode arranged in an opposite hand and this conductor film of this oxygen electrode have been arranged in an opposite hand, and was electrically connected with this hydrogen electrode of this conductor film with this oxygen electrode.

[0008]

[Embodiment of the Invention]The embodiment which applied the electrical energy generating element of this invention to the fuel cell is described based on drawing 1 and drawing 2. The fuel cell 1 by a 1st embodiment is provided with the following.

Conductor film 2.

The generating cell 5 which consists of the hydrogen electrode 3 and the oxygen electrode 4 which sandwich the conductor film 2.

The hydrogen pole charge collector 6 and the oxygen pole collector 7 which sandwich the generating cell 5.

The 1st, the 2nd electroconductive glue layer 8 and 9.

[0009]The conductor film 2 is a film of the polymers which conduct only a hydrogen ion. The hydrogen electrodes 3 are carbon electrodes with a catalyst, and are stuck to the field of one of these in one field of the conductor film 2. The hydrogen pole charge collector 6 is a conductor, and is connected to the field of another side of the hydrogen electrode 3 in electric conduction via the 1st electroconductive glue layer 8. In order to supply hydrogen gas to the hydrogen electrode 3, two or more hydrogen breakthroughs 6a and 8a are formed in the hydrogen pole charge collector 6 and the 1st electroconductive glue layer 8 in same axle. And in order to prevent a break through of the supplied hydrogen gas, the sealant 10 is arranged around the hydrogen electrode 3. The oxygen electrodes 4 are also carbon electrodes with a catalyst, and are stuck to the field of one of these in the field of another side of the conductor film 2. In order that it may be a conductor, and the 2nd may be connected to the field of another side of the oxygen electrode 4 in electroconductive glue layer 9 electric conduction and the oxygen pole collector 7 may supply air (oxygen) to the oxygen electrode 4, two or more breakthroughs 7a and 9a are formed also in the oxygen pole collector 7 and the 2nd electroconductive glue layer 9 in same axle.

[0010]These charge collectors 6 and 7 are for making efficiently and easy drawing of the electric power generated in the generating cell, and comprise gold-plated nickel material. The 1st and 2nd electroconductive glue layer 8 and 9 is DODENTO (a trade name, NIHON solder company make), for example, and the electric resistance value is 1.7×10^{-4} omegacm. Although what contained metal particles, such as silver, in various hardenability polymer, such as an epoxy system, acrylic, and a urethane system, can be used for this electroconductive glue, it is also possible to use alloy system adhesives, such as golden **SHIRIKON. After applying electroconductive glue to the whole surface of the charge collectors 6 and 7 in which the breakthroughs 6a and 7a were formed by screening, the electroconductive glue layers 8 and 9 in which the breakthroughs 6a and 7a and the same axle breakthroughs 8a and 9a were formed can be formed by being stuck by pressure with the 3 or 4th page of an electrode.

[0011]In the above composition, if hydrogen gas is supplied from the breakthrough 6a of the hydrogen pole charge collector 6, hydrogen gas will pass the breakthrough 8a of the 1st electroconductive glue layer 8, and will be supplied to the hydrogen electrode 3. Hydrogen gas serves as a hydrogen ion with the hydrogen electrode 3, and a hydrogen ion passes the conductor film 2 and moves to the oxygen electrode 4 side. Leaking outside the hydrogen supplied to the hydrogen electrode 3 by the sealant 10 is prevented. If air (oxygen) is simultaneously supplied from the breakthrough 7a of the oxygen pole collector 7, air will pass the breakthrough 9a of the 2nd electroconductive glue layer 9, and will be supplied to the oxygen electrode 4. And oxygen reacts to a hydrogen ion in the oxygen electrode 4, and water is generated. At this time, hydrogen emits electrons to the hydrogen electrode 3, potential difference is produced, and it is taken out from the charge collectors 6 and 7 via the electroconductive glue layers 8 and 9.

[0012]The hydrogen electrode 3 and the oxygen electrode 4 are the products made from carbon, and their resistance is strong in itself, and, also in the surface, a grain-like carbon particle exists by a discontinuous condition. Rather than therefore, an electric contact resistance value when the charge collector 6, the hydrogen electrode 3, and the charge collector 7 and the oxygen electrode 4 are carrying out direct contact. The electric contact resistance of the charge collector 6 through the 1st electroconductive glue layer 8 and the

hydrogen electrode 3 and the electric contact resistance value of the charge collector 7 through the 2nd electroconductive glue layer 9 and the oxygen electrode 4 can be held down low, and the collecting effect of the charge collectors 8 and 9 can be heightened. [0013]The electrical energy generating element by this invention is the range which was not limited to the embodiment mentioned above but was indicated to the claim, and various modification is possible for it. For example, when an electroconductive glue layer is formed with material with good breathability, it is not necessary to form the breakthroughs 8a and 9a like the embodiment mentioned above. In the embodiment mentioned above, although electroconductive glue was applied all over the charge collector by screening, it is made to be dotted with two or more electroconductive glue on a charge collector, and as it spreads in a predetermined region, it may form in it at the time of application of pressure with an electrode.

[0014]Even when operating a fuel cell in the state of no humidifying by considering it as the structure where impregnated the hydrogen electrode made from carbon of this invention with the fullerene derivative system proton conductor, and the oxygen electrode was impregnated with the organic matter system proton conductor, hydrogen ion conduction within an electrode is performed good. In an oxygen electrode, since water is generated by the reaction of a hydrogen ion and oxygen ion, an oxygen electrode can be humidified with the water. Hydrogen ion conduction can be performed within a conductor film also by a non-humidified state by considering it as the structure where the conductor film was impregnated with the fullerene derivative system proton conductor.

[0015]It may have a crevice slightly not only among when sticking thoroughly a conductor film, a hydrogen electrode, and a conductor film and an oxygen electrode, but both.

[0016]

[Effect of the Invention]Since the 1st and 2nd electroconductive glue layers are made to intervene, respectively between the 1st charge collector and a hydrogen electrode and between the 2nd charge collector and an oxygen electrode according to the electrical energy generating element according to claim 1, The contact resistance of an electrode and a charge collector can be stopped low, and high collecting efficiency can be acquired.

[0017]Since it becomes unnecessary [the bolt which penetrates the bolt in the cell peripheral part which concludes between charge collectors not only becoming unnecessary but a cell], when the area for bolting Yu becomes unnecessary and it sees by an electrical energy generating element entire configuration, the large surface ratio of the cell per structure area can be taken. Since it is not necessary to give high rigidity to the charge collector itself since a bolt becomes unnecessary, and the thinning of the charge collector can be carried out, thickness of the whole structure can be made thin and it becomes a compact element. In addition, since the bolting join in a cell peripheral part becomes unnecessary, there is also no inconvenience called the fall of adhesion power with the charge collector in a cell center section.

CLAIMS

[Claim(s)]

[Claim 1]A conductor film which conducts a hydrogen ion.

A hydrogen electrode arranged at this one conductor film side.

The 1st charge collector that has been arranged in an opposite hand and was electrically connected with this conductor film of this hydrogen electrode with this hydrogen electrode.

An oxygen electrode arranged with this hydrogen electrode of this conductor film in an opposite hand.

The 2nd charge collector that has been arranged in an opposite hand and was electrically connected with this conductor film of this oxygen electrode with this oxygen electrode.

Are the above the electrical energy generating element which it had, and between this hydrogen electrode and this 1st charge collector, The 1st electroconductive glue layer intervenes, while sticking physically this hydrogen electrode and this 1st charge collector, improve conductivity for it, and between this oxygen electrode and this 2nd charge collector, Conductivity is raised, while the 2nd electroconductive glue layer intervenes and sticking physically this oxygen electrode and this 2nd charge collector.

[Translation done.]